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(54) Title: SECURE, VEHICLE MOUNTED, INCIDENT RECORDING SYSTEM

(57) Abstract

A novel system for gathering, analyzing and storing information for the purpose of motor vehicle accident investigations. An on board, secure vehicle incident capture system, activated when the ignition switch is energized, having a video camera for generating video signals of an incident external to the vehicle, which is digitized into a synchronized data file, carrying a unique vehicle identification and a time indicator with other input data occurring on or about the vehicle such as motion sensors, brake application sensors, and the like. The file is encrypted and stored on a large capacity, code accessible device. Once written, the encrypted file can not be altered or corrupted, decrypted without the encryption key, or accessed without the access authorization code. The data file can be down loaded to be used as evidence.

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SECURE, VEHICLE MOUNTED, INCIDENT RECORDING SYSTEM

BACKGROUND OF THE INVENTION

Field of the invention

The invention is broadly directed to an on-board, vehicle incident surveillance system and, particularly to a system for producing a secure, permanent record of vehicular accidents for evidentiary purposes.

Related Art

Each year there are over 35 million on the road accidents in the United States alone. There are many other vehicles including water craft, and off road vehicles which are involved in mishaps. These can vary from one vehicle to multi-vehicle incidents. These mishaps or accidents result in property and bodily injury in the multi billion dollar range. In most cases, one or more of the parties are at fault and it is the requirement of law enforcement officers, insurance adjusters and the like to find credible witnesses to re-account the factual evidence, so culpability and liability may accurately be determined.

Because of the trauma and the instantaneous nature of vehicle accidents, even the most truthful and unbiased witness may be mistaken as to the facts surrounding an accident. Accounts of an accident, even from third party bystanders may be so radically different as to a make determination of culpability almost impossible. In many cases, because of this lack of consistent credible evidence, many insurance companies make financial reparations to people involved in vehicular accidents without adequate proof of liability. In some cases the circumstances surrounding the incident are greatly exaggerated and even fabricated. Without credible counter evidence the insurance

company must pay. The ultimate looser is the premium paying client who must fund the claim payment.

Further, when physical injury is involved, it would be helpful to have additional information which an observing witness, no matter how credible. would not be able to detect or determine. For example, the impact forces, deceleration forces, exact speed of the vehicle and the like would be helpful in assessing the credibility of certain physical injury claims.

Therefore, a reliable witness that is incapable of emotional reaction, bias, or even perjury is needed to substantiate the circumstances surrounding the incident. Further, monitors to detect and accurately measure certain physical phenomenon would be very useful in determining the facts surrounding an accident. The key to such a system is a non-tamperable, restricted access, large storage capacity, "always on" device. It would therefore be advantageous to have a system with limited access, stored video recording of the incident superimposed with certain physical data, identification of the source, and accurate time synchronization, which could be reviewed after the incident by the authorities on the scene and later by investigators, prosecutors and/or judges to witness firsthand the incident as it actually happened. Thus, a secure, on board system capable of objective, non-tamperable, unbiased evidence, including accurate measurement of certain physical conditions at the time of the accident, would be highly beneficial in determining the exact circumstances surrounding a vehicular accident.

One of the primary drawbacks of prior art surveillance systems is that they are capable of being tampered with or even destroyed and therefore can not be relied upon

as credible evidence, especially in a court of law. One of the primary requisites of a secure system is an encoded access system, and preferably encoding of the recorded information itself. Another failure of prior art systems is external synchronization so that the exact time is accurately embedded into the secure coded information such that information taken from more than one vehicle can be compared on a synchronized basis.

Grist, in U.S. 2,148,119, discloses the use of a camera mounted inside a law enforcement vehicle, which makes a record on photographic film. A speedometer mounted on the hood of the law enforcement vehicle is simultaneously recorded on the photographic film along with the target vehicle. The use of vehicle mounted video cameras to make video records of an incident or scene external to the vehicle are known in the art. Michetti, in U.S. 4,843,463, discloses an audio-visual trip recorder which has two video cameras, one looking forward through the vehicle's windshield and the other looking backwards through the rear window of the vehicle. Superimposed on the recorded images are the time, date and the vehicle's registration or license number. Also superimposed on the recorded images are indications of the vehicle's speed, activation of the brakes, turn signals and engagement of the seat belts. This system, however, is not secure. Lucas et al, in U.S. 5,111,289, discloses a system for law enforcement surveillance work.

SUMMARY OF THE INVENTION

The invention broadly contemplates a novel system for gathering, analyzing and storing information for the purpose of motor vehicle accident investigations. The system

will provide video and other pertinent evidence of circumstances, leading up to and including, actual mishaps in motor vehicle accidents as well as the events that immediately follow. This invention provides a new and more efficient method of investigating vehicular accidents by law enforcement agencies and insurance companies.

An on board, secure vehicle incident capture system, activated when the ignition switch is energized having at least one video camera for generating video signals of an incident external to the vehicle is provided. The video camera, mounted inside the vehicle, is positioned to photograph the scene through the front and/or rear window. The video camera of the instant invention can be mounted to get forward view and/or rearward view and preferably is a wide angled lense that captures a wide angle in front and in the rear of the vehicle. The analogue video signal is generated and stored on a large capacity, code accessible device. In a preferred embodiment, the signal is digitized into a synchronized data file, carrying a unique vehicle identification and a time indicator. The digitized data is stored on a large capacity hard disk which prevents data from being overwritten for very extended periods of time. In another embodiment, a set of transducer generated, digital signals is superimposed on the digitized video data file and synchronized to GMT by means of a transponder, prior to storage. In a preferred embodiment, the superimposed digitized video data file is encoded and written to a storage device. Access to the device is controlled by a systems controller. Once written, the encrypted file can not be altered or corrupted, decrypted without the encryption key or accessed without the access authorization code. A limited access interface accepts the access authorization code and allows the encrypted

superimposed digitized video stored data file to be externally down loaded. The decrypting key can then be used to decrypt the data, thus providing a secure chain of title for evidentiary purposes.

The instant invention provides a video incident capture system having means for real time, high speed data transfer between a video camera, one or more information gathering means, a system controller and a data recorder via intelligent serial communications interfaces to provide a permanent, unalterable, unedited, encrypted video record. Provided in one aspect is a secure incident capture system in which the information recorded on the video sequence is unalterable and includes the time, date, vehicle identification number, the speed of the vehicle and the G forces to which the vehicle is subjected. The preferred incident capture system also includes monitor means, such as transducer input, synchronized to and superimposed upon, the digitized video data file. In a preferred embodiment, means are provided for generating synchronized superimposed signals on the video frame conveying the vehicle speed, the G forces applied, whether the brakes were applied, whether passenger safety belts were fastened and whether a turn signal was activated. The secure, incident capture system of the instant invention has a plurality of microprocessors operating in a real time multi-task "master/slave" configuration.

In one embodiment, the encrypted, superimposed, digitized video data file is decrypted internally within the system using the decryption key, to allow police officers on sight viewing of the restored information to issue citations or the like. In another embodiment the encrypted, superimposed digitized video data file can be optically transmitted, such as by a LED, from the system to a receiver.

A system controller integrates the operation of the video recorder, the transducers, the digitizing buffer, the encoder and the storage as well as the secure access to the data. The system controller has a real time clock generating at least the date and time. Display block generation means disposed between the video camera and the encrypted storage for generating a display block superimposed on the video signals, generated by the video camera is provided. The system controller is real time accessed to update the real time clock and program additional data into the display block means, such as the vehicle ID. The display block displays digitized transducer readouts such as the date, the time, and the vehicle ID. The system also has means for periodically interrogating the transducer readouts, to update the files as a function of elapsed time.

In a preferred embodiment of the video incident capture system, the video recorder and the system controller are enclosed in an explosion and crash proof vault or repository mounted, for example, within the trunk of the vehicle. This vault or repository is designed to withstand a cataclysmic collision and is secured by an authorized service technician, thus preventing the system controller and data storage from being accessed by the operator of the vehicle.

In accordance with the invention, the apparatus or device is energized by the ignition of the vehicle such that, when the ignition is engaged, the system is gathering video and sensor data into a secure data base. The system is operative the moment the ignition switch on the vehicle is activated, such that the operator may not selectively turn off the system. Thus, in accordance with the invention, upon the happening of an accident or incident, the evidence relating to that accident or incident is securely

maintained until downloaded by authorized personnel. There is no possibility of tampering with the evidence subsequent to the incident occurring.

In another aspect, each individual vehicle receives a unique identification code, such as the VIN number or the license number, which uniquely identifies the vehicle from which the information was obtained. In a preferred embodiment the identification number is displayed along with the sensor date simultaneously with the display of the video image.

The method of the invention involves activating a secure vehicle incident capture system having at least one video camera for generating video signals of an incident external to the vehicle; generating a video signal of an incident external to the vehicle; storing video signal of an incident external to the vehicle on a large capacity, code accessible device; and accessing the stored video signal by means of the access code. In a preferred method, the signal is digitized into a synchronized data file, carrying a unique vehicle identification and a time indicator. The digitized data is stored on a large capacity hard drive which prevents data from being overwritten for very extended periods of time.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG 1 is a schematic of one embodiment of the instant invention.

FIG 2 is a side view of the component location in accordance with one embodiment of the instant invention as placed in the vehicle.

DESCRIPTION OF PREFERRED EMBODIMENT

The secure, incident capture system of the instant invention, 10 is shown in FIG 1 which is a schematic only and does not bear relationship to the components within a

vehicle. FIG. 1 is a block diagram of the secure incident capture system 10. The secure incident capture system 10 is preferably mounted in a vehicle as shown in FIG. 2. A video camera 12, such as Model No. TK 900U manufactured by JVC, is mounted inside the passenger compartment of the vehicle and is pointed in a forward direction through the windshield. The dimensions of this video camera are 2 inches x 2 inches x 2.4 inches, and may be mounted between the vehicle's internal rear view mirror and the windshield so as not to obstruct the forward view of the driver or a passenger of the vehicle. The video camera 12 is provided with a wide angle with a motorized iris to increase the operating light range of the video camera 12. Preferably, a like rear mounted camera is used to provide rearward view in a similar manner. The camera employed should have a minimum resolution of for example, 300 x 200 pixcels. Each camera front and rear is black and white or preferably color and preferably runs at 30 frames per second. The video camera 12 preferably employs CCD such that night vision by infrared optics is improved.

The video signals generated by the video camera 12 are converted to digital format and synchronized, as explained below, and stored on hard drive 34 mounted in a sealed vault or repository in the trunk of the vehicle (not shown). The hard disk storage is preferred for large capacity. Any configured hard disk device can be used for example, a Seagate UDMA 8.6 GB hard drive. Additionally tape drive storage can be used either as primary or backup. A video monitor can be connected to video camera 12 by means of video online link 40 to display the scene or incident currently being photographed by the video camera 12. The storage medium can be analog or digital. For example, an endless tape loop or other storage medium could be used. Video

storage can be VCR type with endless loop characteristics, rewriteable CD Rom or computer hard drive with computer compression of video. This allows upgrading as new storage media types are produced.

The hard drive 34 which has the capacity to store the information for 48 hours or more, records the digitized, encrypted output of the video camera 12. The hard drive 34 is controlled by the system controller 22 to activate the hard drive 34 play back recorded information, find referenced events, decode the stored information and the like. This permits authorities at the scene of an accident to be in full control of the hard drive 34 in the vehicle's trunk so that they may reconstruct and view information on sight and monitor any previously recorded incident. Preferably, the system controller 22 prohibits recording over a previously recorded portion of the data, prior to the drive space being released to the system. In this manner a permanent, non-corrupted record is retained. The system controller 22 remembers the point on the disk where the prior recording was terminated and will index to that point on the disk, prior to the resumption of recording, in response to the activating of the secure incident capture system 10.

The analogue output of video camera 12 is fed to input buffer 14 and video online link 40 simultaneously. Video online link 40 is hooked to an online monitor or a standard video tape that is cooperative with the camera and preferably has no storage capability.

Input buffer 14, converts the video camera 12 analogue signal to digital and the serial signal to parallel in order to provide storage and encoding of the digitized signal. The resulting data is a parallel signal, digitized for color and luminance. Simultaneously, the video signal is conveyed via link 50 to the system controller 22,

wherein a time sequencing signal from master clock 24 is added. A programmable integrated circuit, programmed to count second time and also checks sync pulse to WWV acts as a master clock 24. Master clock 24 is connected, via radio link, to WWV interface 48 which sets the master clock to Greenwich mean time (GMT) signal (WWV: radio station with time sync signals to Greenwich mean time). Along with the timing sequence, system controller 22 also integrates other monitoring signals such as for brake input signal 42, speedometer input signal 44, turn signal input indicator 46 and detector 47 such as Radio Shack shock/breakage detector or MCM Electronics 60-3190 from Whistler and 60-6875 from MCM with the sequenced signal in communication with buffer 16 by way of connection 52.

In the preferred embodiment the secure incident capture system 10 superimposes this information on the video signals generated by the video camera 12. This information is synchronized and digitized along with the video signal as previously described. Specific information can be in the form of a display block, normally located near the bottom of the recorded image. The specific information superimposed on video signals generated by the video camera 12 is permanently recorded on the hard drive 34 along with the incident recorded by the video camera 12 and becomes a permanent part of the recorded information. Interface 38 provides a digital read out of the information in buffer 16. The display block preferably contains the month, date and year in the conventional numerical format as the time in hours, minutes and seconds. The display block will also preferably contain an identification of the host vehicle, in which the secure incident capture system 10 is mounted, along with other pertinent data as described above.

Temporary storage 18 is a tri-state buffering system, providing temporary storage of the encoded information. A dual system for dual camera setup i.e. front and rear camera can be provided. Temporary storage 18 has approximately 1 megabyte RAM capacity. The 1 megabyte RAM is preferably divided into 4 blocks of 256 K which facilitates the input and output for two cameras and is designed to provide for color information which requires three times the signal storage of a black and white system. System controller 22 via link 54 controls the operation of temporary storage 18.

Buffer 20 communicates with temporary storage 18; and, permanent hard drive 34, controller 22 via link 56, and output driver buffer 26 via data junction 58. Code access link 32 communicates with system controller 22. Upon receipt of the encoded signal from code access link 32, system controller 22 triggers hard drive 34 to download the encrypted signal through interface 36 to external download for use by the authorities or for secure storage. Simultaneously, through signal from system controller 22, hard drive 34 uploads stored data via data junction 58 back through buffer 20 to temporary storage 18. The data is decrypted upon signal from systems controller 22 and caused to be transmitted in a decrypted state through buffer 20 via data junction 58 to output driver buffer 26 and then to buffer driver 28 which is a parallel serial converter with LED driver. Output driver buffer 26 communicates with buffer driver 28 by means of output parallel data streams 62 and input parallel data stream 60. As light is being emitted, the secure incident capture system 10 can cause a direct readout of decrypted system data through diode read/write head 30.

Turning to FIG 2, there is shown the secure incident capture system 10 in accordance with the instant invention. FIG 2 shows the physical layout of the system

depicted in FIG 1 and further the location of the sensors which form the data input to systems controller 22. A forward video camera 12 is mounted in the front window of vehicle 11 and a rearward camera 13 is mounted in a rearward position to view events rearward of the vehicle. Both forward video camera 12 and rearward camera 13 communicate with systems controller 22. Turn signal input indicator 46, break input signal 42, a detector 47, speedometer input signal 44 and time input signal from WWV interface 48 communicate with systems controller 22.

In operation, the ignition switch (not shown) is activated to energize the system. The cameras 12 and 13 are energized to transmit video data. Controller 22 receives information from transducers 42,44,46,47, and 48. The video signal is digitized and the information synchronized with information from the transducers which is added to the frame along with the vehicle ID. As the vehicle 11 proceeds, the information is time synchronized and digitally stored. The information is accessed, when necessary as set forth above.

Having described the secure, vehicle mounted, incident recording system and how it operates, it is not intended that the secure, vehicle mounted, incident recording system be limited to the embodiment shown in the drawings and described in the specification. It is well known that those skilled in the art may modify or make changes to the disclosed secure, vehicle mounted, incident recording system within the spirit of the invention as described herein and set forth in the claims.

What is claimed is :

1. An on board, secure vehicle incident capture system comprising:

a) at least one video camera for generating video signals of an incident external to the vehicle;

b) a recording device for capturing said video signals having a coded access;

c) a coded access to said recording device for providing a coded access to said recording device;

d) means for down loading said video signal from said coded access recording device.

2. The system of claim 1 wherein said at least one video camera for generating video signals is at least two video cameras.

3. The system of claim 2 wherein said at least two video cameras comprise at least one forward looking video camera and at least one rearward looking video camera.

4. The system of claim 1 wherein said at least one video camera for generating video signals is mounted inside said vehicle and positioned to view said incident through a window of said vehicle.

5. The system of claim 1 wherein said video signals of an incident external to the vehicle are digitized.

6. The system of claim 1 wherein said recording device for capturing said video signals is selected from the group consisting of video tape, a hard disk, and a CD ROM.

7. The system of claim 1 wherein said video signals of an incident external to the

vehicle contain monitor data selected from the group consisting of time and date, vehicle identifier, vehicle speed, brake application indicator, seat belt sensor, and G force sensor.

8. The system of claim 1 wherein said video signals of an incident external to the vehicle are contained in a crash proof, explosion proof repository.

9. The system of claim 1 wherein said means for down loading said video signal from said coded access recording device is an LED.

10. A method for the secure capture of incidents involving vehicles comprising:

a) activating a secure vehicle incident capture system having at least one video camera for generating video signals of an incident external to the vehicle;

b) generating a video signal of an incident external to the vehicle;

c) storing said video signal of an incident external to the vehicle on a large capacity, code accessible device; and,

d) accessing the stored video signal by means of the access code.

11. The method of claim 10 wherein said video signal is digitized into a synchronized data file, carrying a unique vehicle identification and a time indicator.

12. The method of claim 10 wherein said digitized data is stored on a large capacity hard drive which prevents data from being overwritten for very extended periods of time.

13. The method of claim 10 wherein said at least one video camera for generating video signals is at least two video cameras.

14. The method of claim 13 wherein said at least two video cameras comprise at least one forward looking video camera and at least one rearward looking video

camera.

15. The method of claim 10 wherein said at least one video camera for generating video signals is mounted inside said vehicle and positioned to view said incident through a window of said vehicle.

16. The method of claim 10 wherein said recording device for capturing said video signals is selected from the group consisting of video tape, a hard disk, and a CD ROM.

17. The method of claim 10 wherein said video signals of an incident external to the vehicle contain monitor data selected from the group consisting of time and date, vehicle identifier, vehicle speed, brake application indicator, seat belt sensor, and G force sensor.

18. The method of claim 10 wherein said video signals of an incident external to the vehicle are contained in a crash proof, explosion proof repository.

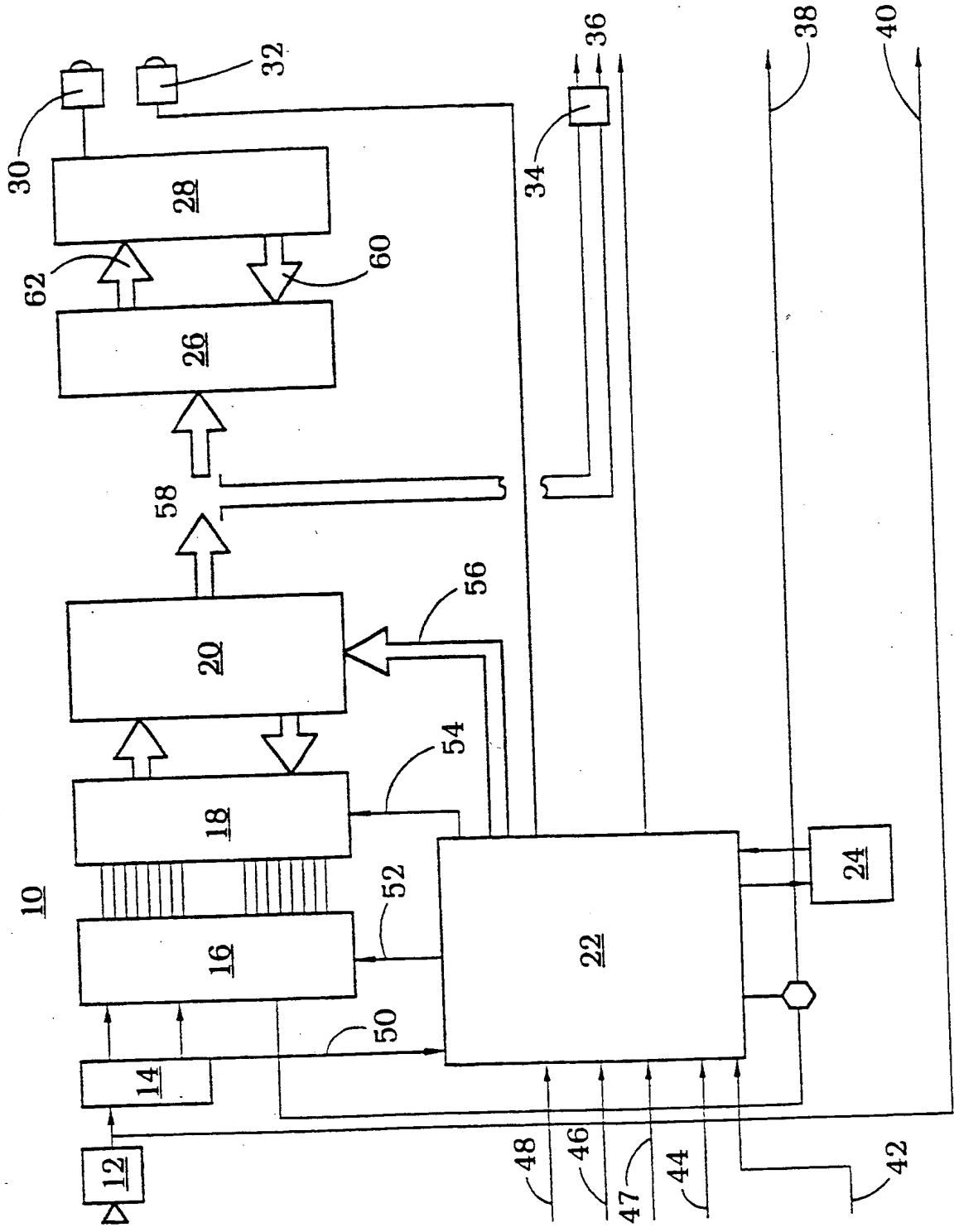
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FIG. 1

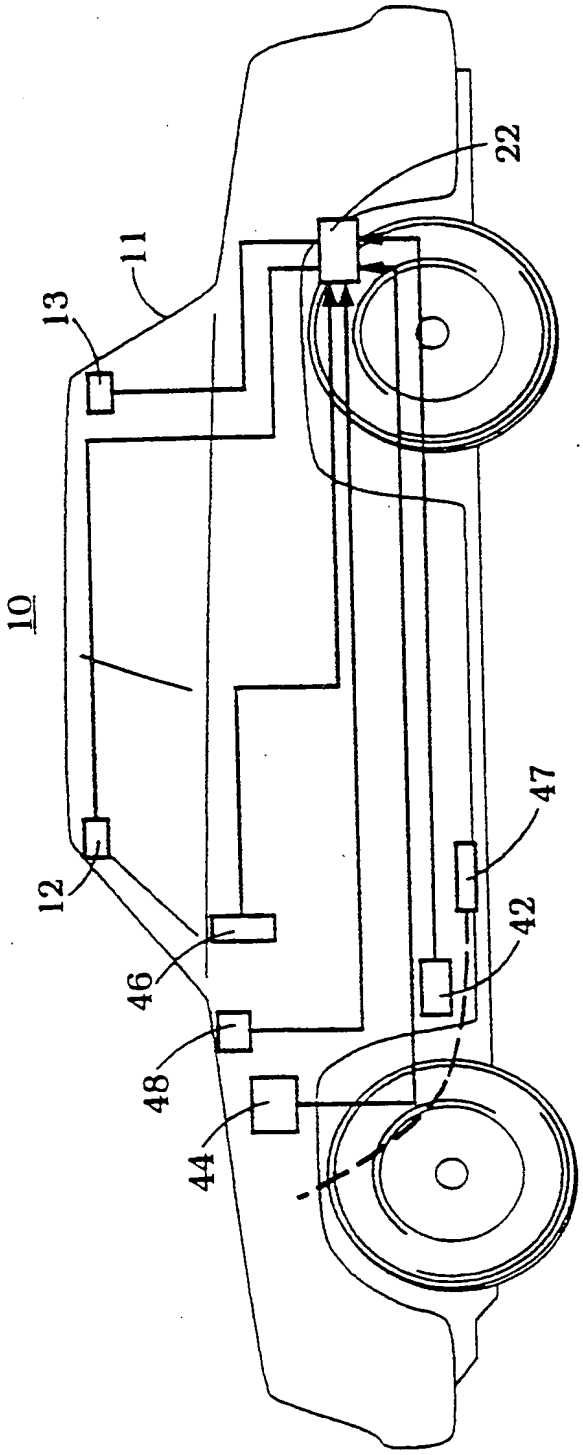

FIG. 2

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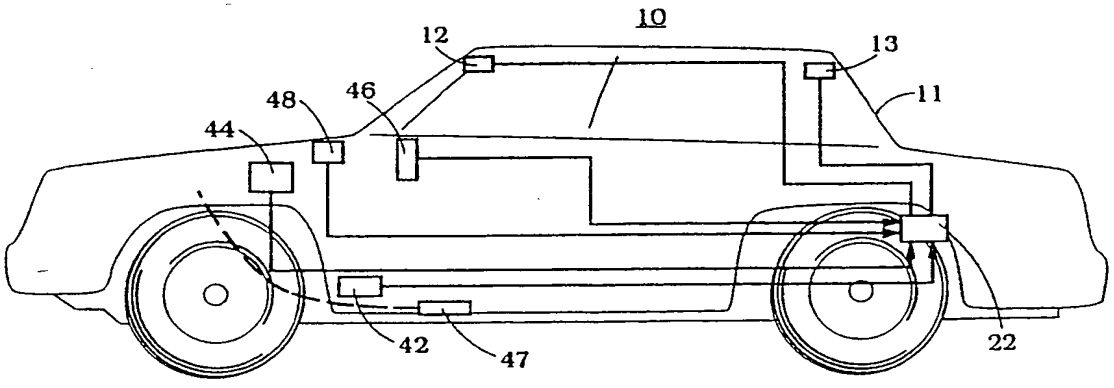

(57) Abstract

A novel system (10) for gathering, analyzing, and storing information for the purpose of motor vehicle accident investigations. An on board, secure vehicle incident capture system, activated when the ignition switch is energized, having a video camera for generating video signals of an incident external to the vehicle, which is digitized into a synchronized data file, carrying a unique vehicle identification and a time indicator with other input data occurring on or about the vehicle such as motion sensors, brake application sensors, and the like. Once written, the encrypted file can not be altered or corrupted, decrypted without the encryption key, or accessed without the access authorization code. The data file can be down loaded to be used as evidence.

INTERNATIONAL SEARCH REPORT

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PCT/US99/12024

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) : H04N 7/18
US CL : 348/143,148,151,156,159
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 348/143,148,151,156,159

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EAST

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,843,463 A (MICHETTI) 27 June 1989, Figs.1 and 2.	1-18
Y	US 5,677,979 A (SQUICCIARINI et al.) 14 October 1997, Figs.1-2 and 4.	1-18

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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